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(54) Printing apparatus comprising plural printer units

(57) Disclosed is a compact, easy-to-maintain printing apparatus featuring both receipt printing and journal printing and being capable of protecting data. Receipt printer unit (70) and journal printer unit (60) are mounted on a bottom housing part (31) of the printing apparatus. Journal printer unit (60) comprises a separate chassis (65) and is removably mounted on a bottom housing part (31). Two top covers (71 and 61) are provided, one hinged to the bottom housing part (31), the other hinged to the chassis (65). The journal printer unit (60) is mounted behind the receipt printer unit (70) and the pivot for both covers is located near to the rearward end of the bottom housing part (31). When opened, top cover (71) for the receipt printer unit (70) rotates over journal printer unit (60), thereby assuring a wide open area above receipt printer unit (70). Top cover (61) of the journal printer unit (60) can be locked to bottom housing part (31) by a keyed locking mechanism (81), thereby preventing improper operation of the journal printer unit (60) during maintenance.

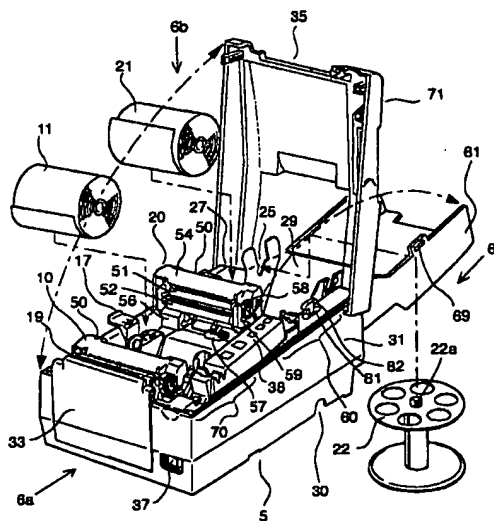


FIG. 2

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## Description

The invention relates to a multiple function printing apparatus comprising plural printer units which is suited to constructing a point-of-sale (POS) station or similar information processing station, and relates particularly to a multiple function printing apparatus capable of simultaneous receipt printing and journal printing.

Many POS stations in use today comprise a personal computer, a display, a cash drawer, a printer, a check reader and other appropriate peripheral devices in a size suited to the scale of the store or check-out area or to meet the specific requirements of the counter arrangement and installation area. The printers used in such POS stations are commonly multiple function printers providing two printing functions, a receipt printing function for printing the receipts handed to customers, and a journal printing function for printing the sales journal retained by the store. Fig. 9 is an illustration of a typical POS station printer enabling both receipt printing and journal printing.

The printer 1 shown in this example comprises a receipt printer unit and a journal printer unit. The receipt printer unit includes a receipt printing unit 10 for printing receipts, paper roll 11 and transport means for feeding the roll paper from paper roll 11 to the printing unit 10 and further to a paper exit. Journal printer unit includes a journal printing unit 20 for journal printing, paper roll 21, take-up reel 22 for winding and holding the printed journal paper and transport means for feeding the roll paper from paper roll 21 to the printing unit 20 and further to the take-up reel. Note that the receipt printing unit 10 and journal printing unit 20 are disposed horizontally side by side (in the direction of printing lines). The paper roll 11 for receipt printing is disposed behind receipt printing unit 10 toward the back of the printer 1 such that receipt paper from paper roll 11 is supplied to the receipt printing unit 10, the receipt is printed, and the roll paper receipt is then fed to the outside of printer 1 through paper exit 2.

The paper roll 21 for journal printing is likewise disposed behind the journal printing unit 20 toward the back of the printer 1, and take-up reel 22 is housed further behind the paper roll 21. After the journal paper is fed from the paper roll 21 to the journal printing unit 20 and is printed, the paper is guided again toward the back of the printer 1 and taken up on the take-up reel 22.

With such printers comprising plural printing units inside a single housing 9 the content, quantity and application of the printed content typically differ with each printing unit.

Comparing journal printing and receipt printing, for example, receipt printing prints a receipt to be handed immediately to the customer, and therefore requires the sales information and store name and possibly other desired information to be printed, and the roll paper then fed far enough out of the printer so that the entire printed part can be cut off by a cutter as a receipt. Jour-

nal printing, however, does not require printing the store name and other non-sales related information, and does not need to feed the roll paper more than is needed to print the needed sales information.

As a result, more roll paper from paper roll 11 is normally consumed for receipt printing than is roll paper from paper roll 21 consumed for journal printing, and paper roll 11 therefore requires more frequent replenishment.

With the printer shown in Fig. 9, top cover 9a which is common to the receipt printer unit and the journal printer unit, must be opened every time the paper roll 11 is replaced. As replacing paper roll 11 is also a task performed frequently by the operator, it is not desirable to open the entire top of printer 1 to replace paper roll 11 because this can leave a poor impression on the customer and creates greater opportunities for dust and other foreign matter to get inside printer 1. In addition, the printed sales journal contains data used by the store owner for accounting and other purposes. Exposing such information to the customer's view is not desirable, and accidental removal or replacement of the journal paper by the operator when replacing the receipt paper could create accounting and other business problems.

As a result the top cover may be divided into a part covering the receipt printer unit and another part covering the journal printer unit so that only the cover part relevant to the paper roll that must be replaced needs to be opened. With printer 1 shown in Fig. 9, for example, top cover 9a could be divided into two parts opening to the right and to the left, respectively. This, however, limits the openable area and makes it more difficult to replace the paper roll.

Depending upon what each printer unit is used for, it may also be desirable to use different types of printing units for each in a multiple function printer. For example, a thermal transfer printing unit may be sufficient for the receipt printer unit because the printed receipts are simply passed to the customer. The printed journal, on the other hand, may be used for multiple purposes including accounting and purchasing. It may therefore be preferable to use an impact type printing unit for journal printing to print multiple copies. However, manufacturing multiple function printers offering various combinations of printing units according to individual user requirements is more difficult and time consuming, thus increasing the unit cost.

The object of the present invention is to remedy the shortcomings of the prior art explained above and to provide a printing apparatus facilitating the combination of various types or printer units in one printer body in accordance with the demand of a particular user, thereby lowering the device price and shortening the turnaround of the product.

These objects are achieved with a printing apparatus as claimed in claim 1. Preferred embodiments of the invention are subject-matter of the dependent claims.

A printing apparatus embodying the present invention comprises a first and a second printer unit - not

excluding more than two printer units - of which the first one is in the form of an exchangeable assembly that can be easily removed from and reinstalled into the housing of the printing apparatus. The first printer unit has its own housing or chassis preferably provided with a cover. In this case, when the housing of the printing apparatus is opened such as to replace the recording medium for the second printer unit, there is no need to open the cover of the second printer unit. Since the first printer unit is exchangeable one of various types such as a thermal transfer type printer unit, an impact type printer unit etc. can selectively be employed to fit the needs of a user.

Further objects and advantages achieved by the present invention will be understood from the following description of preferred embodiments in conjunction with the accompanying drawings, wherein:

- Fig. 1 is an external overview of a printer according to a preferred embodiment of the invention,
- Fig. 2 is an overview of the printer shown in Fig. 1 with the top covers open,
- Fig. 3 is a side cross sectional view of the printer shown in Fig. 1,
- Fig. 4 is a bottom view of the printer shown in Fig. 1,
- Fig. 5 is an overview of the printer shown in Fig. 1 with the journal printer unit taken out of the printer,
- Fig. 6 is an overview of the printer shown in Fig. 1 with only the top cover of the receipt printer unit open,
- Fig. 7 is an overview of the printer shown in Fig. 1 with the front cover open,
- Fig. 8 is an overview of the printer shown in Fig. 1 used to describe how roll paper is loaded into the printer,
- Fig. 9 is an overview of a conventional printer in which the receipt printing and journal printer units are disposed horizontally side by side,
- Fig. 10 is an enlarged partial view of the input connector and the output connector,
- Fig. 11 is an example of the electrical connection of detection terminals of the input connector and the output connector, and
- Fig. 12 is a flow chart used to describe the way of detecting the connection and type of

exchangeable printer unit.

As shown in the figures, the printer 5 according to the present embodiment has an elongate substantially rectangular parallelepiped shape that is long from the front 6a to the back 6c with the its components enclosed in a housing 30 made of plastic. This housing 30 comprises a bottom housing part 31 for accommodating the various mechanisms of the printer 5, top housings or covers 61 and 71 that are openable upward from the bottom housing part 31 toward the top 6b and rear 6c of printer 5 (in the clockwise direction as seen in Fig. 1), and a front cover 33 that is openable toward the front 6a of printer 5 (in a counter-clockwise direction as seen in Fig. 1). A monitor window 34 enabling the user to check the results of journal printing and to write on the printed journal paper is disposed at approximately the top center of printer 5 near to the front end of top cover 61. When front cover 33 is closed (as in Fig. 1), paper exit 35 is formed between the upper edge of front cover 33 and the front edge of top cover 71. The printed receipt paper is ejected from the top of front cover 33 through this paper exit 35.

A cut-out opening is formed in the right side of the top cover 71 to expose an operating panel 36 disposed on bottom housing part 31. Operating panel 36 and a power switch 37 of which the latter is disposed at the front 6a of bottom housing part 31 enable manual control of printer 5.

As shown in Fig. 2 and Fig. 3 printer 5 comprises two subprinters 60 and 70 disposed in series one behind the other from front 6a to back 6c of printer 5. The front subprinter 70 is a subprinter (receipt printer unit) for receipt printing and comprises in sequence from front 6a: paper cutter 19 for automatically cutting off the receipt after printing, receipt printing unit 10 for printing the receipts, and paper supply compartment 17 for storing the paper roll 11 used for receipt printing. The back subprinter 60 is the subprinter (journal printer unit) for journal printing, and comprises in sequence from front 6a: journal printing unit 20 for journal printing, paper supply compartment 27 for storing the paper roll 21 used for journal printing, and take-up reel or storage compartment 29 for storing the take-up reel 22 onto which the journal paper is wound after journal printing.

The tops of journal printer unit 60 and receipt printer unit 70 are separately covered by the top covers 61 and 71, respectively, which are pivotally mounted at the back 6c of journal printer unit 60 behind receipt printer unit 70. Top cover 71 is hinged to bottom housing part 31 while top cover 61 is hinged to a chassis 65 explained later.

Locking mechanism 81 providing a keyed lock for securing top cover 61 to bottom housing part 31 is disposed at the back of bottom housing part 31 in the area of journal printer unit 60. Slit 69 is provided in the side of top cover 61 at a position opposite to locking mechanism 81 for engaging a lock plate (not shown in the figures) that is moved in and out of bottom housing part 31

by locking mechanism 81. By closing top cover 61 onto bottom housing part 31 and operating key 82 of locking mechanism 81, top cover 61 is locked in its closed condition on bottom housing part 31. As a result, paper roll 21 in journal printer unit 60 and the printed journal paper taken onto take-up reel 22 are protected, and journal printer unit 60 which can be mounted on and removed from bottom housing part 31 as described below, is simultaneously locked to bottom housing part 31.

As shown in Fig. 3 identically constructed printing mechanisms 50 are used in both receipt printing unit 10 of receipt printer unit 70 and journal printing unit 20 of journal printer unit 60 in this embodiment.

Each printing mechanism 50 comprises a platen roller 51, a thermal head 52 for pressing the heat-sensitive receipt or journal paper against platen roller 51 and printing on the paper, and a guide roller 53 for guiding the roll paper to the platen roller 51. These components are mounted on a support base 55 which is arranged substantially perpendicularly to and inside bottom housing part 31. Platen roller 51 and motor 56 are disposed on the left side of support base 55 as seen from front 6a. Motor 56 is connected to platen roller 51 by means of a gear set not shown in the figures to rotate the platen roller 51 at a predetermined speed. In the following, where necessary, indices "1" and "2", respectively, are used to distinguish the printing mechanism and its components of the receipt printing unit 10 from those of the journal printing unit 20, although these indices are not shown in the drawing.

Knob or handwheel 58 and release lever 59 are disposed on the right side of platen roller 51 as seen from front 6a, i.e., on the same side as operating panel 36. Knob 58 is used to manually rotate platen roller 51, and release lever 59 is used to release motor 56 and thereby reduce the load when manually turning platen roller 51 using knob 58. More specifically, all operating means used to manually operate printer 5 are concentrated on one side, i.e., the right side in this embodiment, of the printer 5. Operation by the user is therefore facilitated, and the operator can easily operate the printer using one hand.

For guiding the printed paper toward the back of the printer a guide plate 54 is mounted above platen roller 51.

On the edge 52a of thermal head 52 opposite that which contacts platen roller 51 is fastened a lever 57 for opening the printing area defined by both platen roller 51 and printing part 52b of thermal head 52. When lever 57 is rotated, thermal head 52 is separated from platen roller 51, thus opening the recording medium path inside printing mechanism 50 wide to the outside. When a paper jam occurs inside printing mechanism 50, lever 57 can, thus, be operated to open the recording medium path and enable the jammed paper to be easily removed.

Receipt paper 12 is fed by guide roller 53<sub>1</sub> from paper roll 11 housed in paper supply compartment 17

behind receipt printing unit 10 to the printing mechanism 50<sub>1</sub>. The receipt paper 12 is then guided to platen roller 51<sub>1</sub>, and advanced by the rotation of platen roller 51<sub>1</sub> to the printing part 52b<sub>1</sub> of thermal head 52<sub>1</sub> for receipt printing. The printed receipt paper 12 is then guided to cutter 19b of paper cutter 19 by guide vane 19a, which extends from paper cutter 19 positioned at the front of receipt printing unit 10 toward platen roller 51<sub>1</sub>. After passing cutter 19b, receipt paper 12 is ejected to the outside through paper exit 35. When printing on receipt paper 12 by receipt printing unit 10 is completed, receipt paper 12 is thus ejected from printer 5 and automatically cut by cutter 19b of paper cutter 19 to form a printed receipt that can be handed to the customer. Note that an automatic paper cutter as described here is preferable but not essential to the present invention.

Journal paper 23 is similarly supplied by guide roller 53<sub>2</sub> to platen roller 51<sub>2</sub> of printing mechanism 50<sub>2</sub> from paper roll 21 held in paper supply compartment 27 disposed behind printing unit 20. The journal paper 23 is likewise advanced by the rotation of platen roller 51<sub>2</sub> to the printing part 52b<sub>2</sub> of thermal head 52<sub>2</sub> for journal printing, and is transported over guide plate 54<sub>2</sub> to the back of journal printing unit 20. The printed journal paper 23 is then taken up on take-up reel 22 disposed in take-up reel compartment 29 behind paper supply compartment 27. To drive take-up reel 22 and wind the printed journal paper 23 onto take-up reel 22, a reel bearing 25 supporting shaft 22a of take-up reel 22, a motor 26 for rotating take-up reel 22, and a power transfer gear train 28 are disposed in take-up reel compartment 29.

Monitor window 34 enabling the operator to visually confirm the content printed on journal paper 23 is disposed approximately above guide plate 54<sub>2</sub> of printing mechanism 50<sub>2</sub>. With the guide plate 54<sub>2</sub> also functioning as a writing pad, monitor window 34 also enables the operator to write on the journal paper to add memos, sign the journal, or correct printing errors. The printing mechanism 50<sub>2</sub> of the journal printing unit 20 of the present embodiment is positioned slightly higher than that of the receipt printing unit 10, thereby bringing the journal paper 23 as close as possible to monitor window 34. This improves the visibility of the paper through monitor window 34, and makes it easier to write on the paper.

A control circuit board 92 for passing print data to the journal printer unit 60 and receipt printer unit 70 and controlling these printer units, and connectors 93 for connecting the control circuit so as to send and receive data and control signals between the printer units and external devices, are housed in an installation space 91 on the bottom of bottom housing part 31. The control circuit board 92 and connectors 93 are disposed primarily below receipt printer unit 70 at the front of housing 30, and all connectors 93 are installed so as to face the back 6c of printer 5.

The front and side walls of bottom housing part 31

are extended downward below paper supply compartment 27 to create a space 95 for any cables. As shown in Fig. 4, print data and control signal cables 96 and 97 which may be connected to connectors 93a and 93b can be accommodated in this space 95. This enables printer 5 according to the present embodiment to be placed tight against a wall or other device without cable connectors 96a protruding from the back of printer 5.

Because the cable connectors are not externally exposed and the cables can be held in space 95 and connected without being excessively bent, the cables are less likely to disconnect from the printer-side connector jacks, and short circuits and other problems arising from tightly bending the cables can be prevented. Note, however, that cut-outs 31a are provided in the side wall extensions of bottom housing part 31 so that the interface cables can be led out through the side of the printer 5 as may be required by the printer location.

Referring again to Fig. 3, journal printer unit 60 of printer 5 according to the present embodiment has a separate housing or chassis 65, and can be mounted in and dismounted from the back of bottom housing part 31 in which the control circuit board is provided. All components constituting journal printer unit 60 are assembled on this separate chassis 65, and top cover 61 is pivotally mounted at the back of chassis 65. Input connector 63 for obtaining print data through interface circuit board 64 is provided in front of printing unit 20 and connected to chassis 65 so as to move together with chassis 65. An output connector 98 is provided on the bottom of bottom housing part 31 such that when journal printer unit 60 is installed on bottom housing part 31, output connector 98 and input connector 63 are connected to each other to enable data communication. When journal printer unit 60 is removed from bottom housing part 31, input connector 63 moves with chassis 65 and disconnects from output connector 98.

As shown in Fig. 11, input connector 63 includes a connection detection terminal 63a allowing printer 5 to detect whether journal printer unit 60 is installed and connected by detecting the voltage level of this terminal through a terminal 98a of output connector 98. One or more printer type detection terminals are preferably also provided in input connector 63 (in the example illustrated in Fig. 11 two such terminals 63b and 63c are provided). Printer 5 can then also detect what type of printer unit is installed by detecting the voltage level of this or these terminals through corresponding terminals (98b and 98c in the example of Fig. 11) of output connector 98. Note that the term "printer type" used herein includes both the type of printing mechanism, e.g., thermal transfer or impact type printing mechanism, and the type of printer application, e.g., journal printing or label printing. By thus determining what type of printer unit is connected, printer 5 can appropriately control the printing process according to the printer unit type.

Referring to Fig. 12, a controller 92a on control circuit board 92 detects (step 101) whether a printer unit 60 is connected by detecting the state (L = LOW or H =

HIGH) of port  $i_2$ . As will be appreciated from Fig. 11, when the state is L printer unit 60 is connected while when it is H printer unit 60 is not connected. When printer unit 60 is not connected, the process ends. Otherwise, the controller checks the state of the ports  $i_0$  and  $i_1$  to detect the type of the connected printer unit 60 (step 102). In the example the state (L = LOW or H = HIGH) of port  $i_0$  indicates the type of printing mechanism, e.g., thermal or impact, while the state (L = LOW or H = HIGH) of port  $i_1$  indicates the application type of printer unit 60, e.g., journal printer or label printer. Based on the combination of the states of ports  $i_0$  and  $i_1$  controller 92a looks up table 1 (see Fig. 12) to find out the type of printer unit. As illustrated in Fig. 11, one way of setting the type on the printer unit 60 side is the use of a DIP switch 60a. While such a DIP switch is programmable, the setting could be made by fixedly connecting or not connecting terminals 63b and 63c to ground. Other types of switches can be employed instead of a DIP switch as long as they serve the desired purpose. In the example shown and explained, two terminals are used for transferring the type information from the printer unit 60 to the control circuit board 92. The two terminals allow for a total of four different type. It goes without saying that only one terminal is sufficient where only two different types of printer unit are available, while more than two terminals may be used where a distinction between more than four different types is required.

Fig. 5 shows the printing apparatus when journal printer unit 60 is removed from bottom housing part 31. Because journal printer unit 60 can be removed from printer 5 as a complete assembly, the user can easily change the type of journal printer unit 60 used. For example, while the same thermal head 52 is used in the printing mechanisms of both the journal printer unit 60 and the receipt printer unit 70 in this embodiment, it may be desirable to print multiple journal copies in which case a wire dot impact type printing mechanism may be preferable for the journal printer unit 60.

This can be easily accomplished using printer 5 according to the present embodiment by simply changing journal printer unit 60 from a thermal transfer type printer to an impact type printer, thereby achieving a printer 5 with the printer unit combination best suited for the user's purposes. With a multiple function printer 5 according to the present embodiment, therefore, it is not necessary to assemble printer 5 according to user requirements in the factory, rather the printer functions desired by the user can be assembled at the time of delivery to the customer to provide a multiple function printer featuring the specifically desired functions. It is also possible to freely change the printer type after the printer is delivered to the user when the operating environment or printing needs change.

The multiple function printer according to the present embodiment therefore enables flexible system configuration, and can be provided at a low cost in a short time because complex, flexible production lines

are not needed.

It is also possible to keep journal printer unit 60 containing journal paper imprinted with valuable sales information inside a safe or other secure location after the store closes for the day. When opening the next day, it is only necessary to reinsert journal printer unit 60 into bottom housing part 31, and the relatively time-consuming, troublesome steps of installing roll paper and feeding the paper to the take-up reel 22 can be eliminated.

In Fig. 6 journal printer unit 60 is shown installed into bottom housing part 31 with top cover 61 of journal printer unit 60 locked in its closed position while top cover 71 of receipt printer unit 70 is open. As described above, normally consumption of paper roll 11 in receipt printer unit 70 is greater than that in journal printer unit 60, and the paper roll in receipt printer unit 70 must therefore be replaced more frequently. This is accommodated in printer 5 according to the present embodiment by providing separate top covers 71 and 61 for receipt printer unit 70 and journal printer unit 60, respectively, so that the paper for receipt printer unit 70 can be replaced by opening only top cover 71. Paper roll 11 in receipt printer unit 70 can therefore be replaced by simply rotating the front of top cover 71 up from front 6a toward the back as shown in Fig. 6.

It is therefore only necessary to open the section in which the paper roll must be replaced, i.e., receipt printer unit 70 in the example shown in Fig. 6. The appearance of serious trouble is thus avoided even if the paper roll must be replaced in front of customers because only part of printer 5 is opened. This creates a better impression while also preventing exposure of past sales data recorded on the journal paper.

Loss of important data and similar problems resulting from the operator mistakenly replacing the paper roll for journal printer unit 60 are also avoided because top cover 61 of journal printer unit 60 is locked to bottom housing part 31 by locking mechanism 81. Other problems that may arise from dust and other foreign matter entering journal printer unit 60 when replacing the receipt paper are also avoided because the journal printer cover need not be opened.

Note that with printer 5 according to the present embodiment top cover 71 is hinged to bottom housing part 31 at a position opposite receipt printer unit 70, i.e., rearward of journal printer unit 60, in the same manner as top cover 61. Thus, when top cover 71 opens, it rotates over or to the back of journal printer unit 60, and a wide area free of top cover 71 is assured above receipt printer unit 70.

As a result the printer is easy to maintain and enables paper to be easily replaced.

As described above, replacement of a paper roll, removal of paper jam and other maintenance works are needed more frequently with receipt printer unit 70 than journal printer unit 60. These needs are accommodated by placing receipt printer unit 70 at the front of printer 5 and opening top cover 71 from the same position as top cover 61 of journal printer unit 60 located behind receipt

printer unit 70 in the present embodiment, thereby achieving a printer that is easy to maintain and protects valuable data.

As described above, the printer of the invention enables easy maintenance of receipt printer unit 70 while simultaneously enabling easy maintenance of journal printer unit 60 when it is needed. More specifically, if both top cover 71 of receipt printer unit 70 and top cover 61 of journal printer unit 60 are opened at the same time, all internal components are readily accessible because the receipt printing unit 10, paper supply compartment 17, journal printing unit 20, paper supply compartment 27, and take-up reel compartment 29 are arranged in-line (one behind the other) from the front 6a to the back 6c of printer 5, and these components are non-overlapping, i.e., no component is hidden by another component overlying it. Access to the receipt printing unit 10 of the printer 5 according to the present embodiment is also improved for paper jam removal and regular maintenance because front cover 33 is designed to open forward.

Paper jams in parts of journal printer unit 60 that are not easily accessible from the top can also be easily removed by simply removing journal printer unit 60 from bottom housing part 31.

The appearance of printer 5 when the printer is opened to access the inside for paper jam removal, to correct other problems, or for maintenance is shown in Fig. 7.

When top covers 61 and 71 are opened upward, each of the major components inside printer 5 can be seen. When front cover 33 is then opened forward, paper cutter 19 is exposed and any paper jams therein can be easily removed. Paper cutter 19 is fixed to the chassis of printer 5 so that it can be turned toward the front. When paper cutter 19 is thus rotated forward in the direction of arrow A, printing mechanism 50<sub>1</sub> of printing unit 10 is almost completely exposed. When lever 57<sub>1</sub> of thermal head 52<sub>1</sub> is then turned forward in the direction of arrow B, thermal head 52<sub>1</sub> drops forward to open the recording medium path. Any paper pieces or paper jams between thermal head 52<sub>1</sub> and platen roller 51<sub>1</sub> can thus be easily removed.

The motor and platen roller 51<sub>1</sub> are disengaged by rotating release lever 59<sub>1</sub> on the right side of platen roller 51 in the direction of arrow C, thereby enabling platen roller 51<sub>1</sub> to be rotated easily by turning knob 58<sub>1</sub>, which is also on the right side. It is therefore also easy to remove paper jams from the vicinity of platen roller 51<sub>1</sub>.

Although reference is made to the elements of printing mechanism 50<sub>1</sub> in the preceding paragraphs, because the same printing mechanism 50 is used for both receipt printing unit 10 and journal printing unit 20 in printer 5 according to the present embodiment, paper jams are corrected in the same manner in both printing mechanisms 50.

All manually operated levers and knobs are provided on the same side of the printer, i.e., the right side

as seen from front 6a in the present embodiment. It is therefore simple for the operator to correct paper jams and similar problems with the printer according to the present embodiment, thereby continuing service without keeping customers waiting.

The procedure for installing a paper roll for journal printer unit 60 and receipt printer unit 70 is shown in Fig. 8.

The first step is to open top cover 71 or 61, and then to set paper roll 11 or 21 in paper supply compartment 17 or 27, respectively. Lever 59 on the right side of the respective printing mechanism 50 is then pulled forward to free platen roller 51 from the motor. By then turning knob 58 to manually rotate platen roller 51, receipt paper 12 or journal paper 23 is pulled from paper roll 11 or 21 through the recording medium path to the correct position. The process for setting the paper in position is the same for both receipt paper 12 and journal paper 23, and release lever 59 and knob 58 are operated in the same direction in both printing units.

The lengthwise (longitudinal) in-line arrangement of the receipt printing unit 10, paper roll 11, journal printing unit 20, paper roll 21, and take-up reel 22 in printer 5 according to the present embodiment realizes a flat, narrow printer. As a result the printer is compact and easy to maintain, enables paper jams to be quickly resolved, and enables paper to be easily replaced. With receipt printer unit 70 frequently requiring roll paper replacement, this design improves receipt printer unit maintenance performance, thereby enabling service to be resumed more quickly when a problem does occur so that customers are not kept waiting. As a result, printer 5 is ideally suited as a printer for POS stations.

In a printing apparatus in which the receipt printer unit and journal printer unit are arranged vertically one upon the other or at least vertically overlapping, problems caused by paper chaff in one printer unit can also result in problems in the other printer unit. With printer 5 according to the present embodiment, however, the in-line arrangement of the receipt printer unit 70 and journal printer unit 60 prevents such chaff in one printer unit from creating problems in the other printer unit, in addition to providing excellent maintenance characteristics and reducing printer size. Because the receipt printing unit 10 and journal printing unit 20 are not stacked one above the other in the printer of the invention, the printed content can be easily viewed from above the printer in both printing sections.

The components of each, receipt printer unit 70 and journal printer unit 60, are also installed in line, i.e., one behind the other, in printer 5 of the present embodiment. More specifically, receipt printing unit 10, paper supply compartment 17, journal printing unit 20, paper supply compartment 27, and take-up reel compartment 29 are arranged in line from front 6a to back 6c. As a result, a narrow, compact multiple function printer 5 comprising two print functions, specifically receipt printing and journal printing, can be achieved.

It is also possible to achieve a multiple function

printer with the maintenance characteristics and other features of the in-line printer arrangement described above in a printer in which receipt printer unit 70 and journal printer unit 60 are placed laterally side by side with the top cover for the receipt printer unit and the top cover for the journal printer unit both disposed to have their respective pivot at a position opposite the receipt printer unit, i.e., at the outside edge of the journal printer unit. However, arranging the journal printer unit 60 and receipt printer unit 70 one behind the other as described in printer 5 of the above embodiment achieves a narrow printer 5 in which space to house a take-up reel can be easily incorporated without wasting space. It can therefore be concluded that arranging plural printer units in line front-to-back is more efficient for reducing the size of such a multiple function printer, and achieves a narrow printer that can be easily combined with a cash drawer, personal computer, and display to assemble a POS station.

This long, narrow shape also makes it easier to install the printer at spaces on the side or along the edges of the POS installation area. The printer of the invention can thus be easily combined with other components to assemble a POS station, and can be used to efficiently construct a multiple function POS station in a confined area.

It should be noted that take-up reel compartment 29 can be provided either before or after journal printing unit 20, but it is preferable to place it behind journal printing unit 20 as described above to enable the printed information to be seen or written to through monitor window 34.

Operation is also improved by placing receipt printer unit 70 at the front 6a for easier access to the printed receipts that must be handed to the customer. The printer of the invention is thus compact, easy to use, and suitable for assembling POS stations.

Take-up reel compartment 29 and paper supply compartment 27 are also disposed in this same flat, i.e., non-overlapping, in-line arrangement to reduce the height of printer 5 in the present embodiment. Paper roll 21 and take-up reel 22 are, however, replaced at the same time, and it is therefore possible to arrange the corresponding two compartments one above the other. Other than slightly increasing the overall height of printer 5, this arrangement makes it possible to provide a narrow and even shorter printer 5 while having no affect on either the maintenance or operation of printer 5.

It should be further noted that while the present invention has been described using, by way of example, a printer equipped with both receipt printing and journal printing functions for use as a POS printer, the present invention is not limited to the application with POS printers. For example, the printer according to the present invention can be applied to a printing apparatus comprising printer units using different printing mechanisms, e.g., a thermal printer unit and a dot matrix impact printer unit, and still reduce the size of the overall print-

ing apparatus while maintaining good maintenance and operation characteristics by arranging the two printing units and the space in which the corresponding recording media are stored longitudinally in-line.

A narrow, compact printer can also be achieved in printers that use cut-sheet forms instead of roll paper by using the longitudinal in-line arrangement of the present invention.

Furthermore, while the present invention has been described using, by way of example, a dedicated POS printer, the invention can also be applied to integrated apparatuses combining the respective functions of a cash drawer, personal computer and display, and printer. By providing separate top covers for the receipt and journal printing units with both covers hinged at the journal printing unit side, different printing functions can be compactly provided in the confined space inside such integrated apparatuses while retaining the maintenance and operating characteristics described above.

It should also be noted that while the invention has been described above combining a receipt printer unit and journal printer unit, the invention is not limited to this case. The invention can, for example, be applied to combine a receipt printer unit and a label printer unit, a journal printer unit and a label printer unit, or various other printer types according to the specific application. In addition, while a thermal transfer printer has been used, by way of example, for the printing mechanism above, dot impact printers, ink jet printers, and other common printing mechanisms can also be used. Furthermore, different types of printing mechanisms can be used for the two printer units.

## Claims

### 1. A printing apparatus comprising:

first and second printer units (60, 70) for printing on first and second recording media (23, 12), respectively, each printer unit having a printing mechanism (50) including

- a print head (52) for printing on said recording medium,
- a platen (51) disposed adjacent to said printing means, and
- transport means (51, 53, 56) for feeding the respective recording medium (23, 12) along a recording medium path through a printing area defined between said print head (52) and said platen (51); and

a first housing (30, 31) for housing said first and second printer units (60, 70),

wherein the first printer unit (60) further comprises a second housing (65) detachably mounted to said first housing and including the printing mechanism (50).

2. The apparatus according to claim 1 wherein the first printer unit (60) comprises a supply compartment (27) for storing a supply (21) of said first recording medium (23).

3. The apparatus according to claim 2 wherein the first printer unit (60) further comprises a storage compartment (29) for storing the first recording medium (23) after it has been printed.

4. The apparatus according to claim 3 wherein the first printer unit (60) further comprises a cover (61) disposed to enable opening and closing of the second housing (65), said cover, when closed, covering said recording medium path at least from said print head (52) to said storage compartment (29).

5. The apparatus according to claim 4 further comprising a window (34) in said cover (61) exposing the printing on said first recording medium (23).

6. The apparatus according to claim 4 or 5 further comprising a keyed locking mechanism (69, 81, 82) for said cover (61) in its closed condition.

7. The apparatus according to any one of the preceding claims further comprising common control means (92) provided for both said first and said second printer unit (60, 70) and adapted to receive data from a host device, said control means having a first connector (98),

wherein the first printer unit (60) comprises a second connector (63) for connecting and disconnecting to said first connector.

8. The apparatus according to claim 7 wherein the common control means (92) comprises a connection detecting means (92a, i<sub>2</sub>) for detecting whether or not said second connector (63) is connected to said first connector (98).

9. The apparatus according to claim 8 wherein the connection detecting means comprises a printer unit detection means (i<sub>0</sub>, i<sub>1</sub>) for detecting the type of the first printer unit (60) whose second connector (63) is connected to said first connector (98).

10. The apparatus according to any one of claims 7 to 9 wherein the second connector (63) is fixed to said second housing (65) and adapted to connect to said first connector (98) when the first printer unit (60) is installed in the printing apparatus.

11. The apparatus according to any one of the preceding claims wherein said first and second printer units (60, 70) are arranged one behind the other inside said first housing (30, 31).

12. The apparatus according to claim 1 wherein the



printing mechanisms (50) of the first and second printer units (60, 70) are interchangeable.

13. The apparatus according to any one of the preceding claims wherein each of said printer units (60, 70) has a different type of printing mechanism (50). 5
14. A printer unit for use as one of plural printer units in a printing apparatus (5) having common control means (92) shared by said plural printer units for receiving data from a host device, and a first housing (30, 31) for housing the plural printer units (60, 70) and the common control means, wherein the printer unit (60) is adapted to be removably mounted in said first housing (30, 31) and comprises a printing mechanism (50) including: 10  
a print head (52) for printing on a recording medium,  
a platen (51) disposed adjacent to said printing means, 20  
transport means (51, 53, 56) for feeding the recording medium (23, 12) along a recording medium path through a printing area defined between said print head (52) and said platen (51), 25  
a second housing (65) for housing said printing mechanism (50), and  
connection means for detachably connecting the printer unit to the common control means of said printing apparatus. 30
15. The printer unit according to claim 14 further comprising a supply compartment (27) for storing a supply (21) of said recording medium (23). 35
16. The printer unit according to claim 15 further comprising a storage compartment (29) for storing said recording medium (23) after it has been printed. 40
17. The printer unit according to claim 16 further comprising a cover (61) disposed to enable opening and closing of the second housing (65), said cover, when closed, covering said recording medium path at least from said print head (52) to said storage compartment (29). 45
18. The printer unit according to claim 17 further comprising a window (34) in said cover (61) exposing the printing on said first recording medium. 50
19. The printer unit according to claim 17 further comprising means (69) for allowing the cover (61) to be locked by a keyed lock to said first housing (30, 31) when said printer unit (60) is installed in said printing apparatus. 55

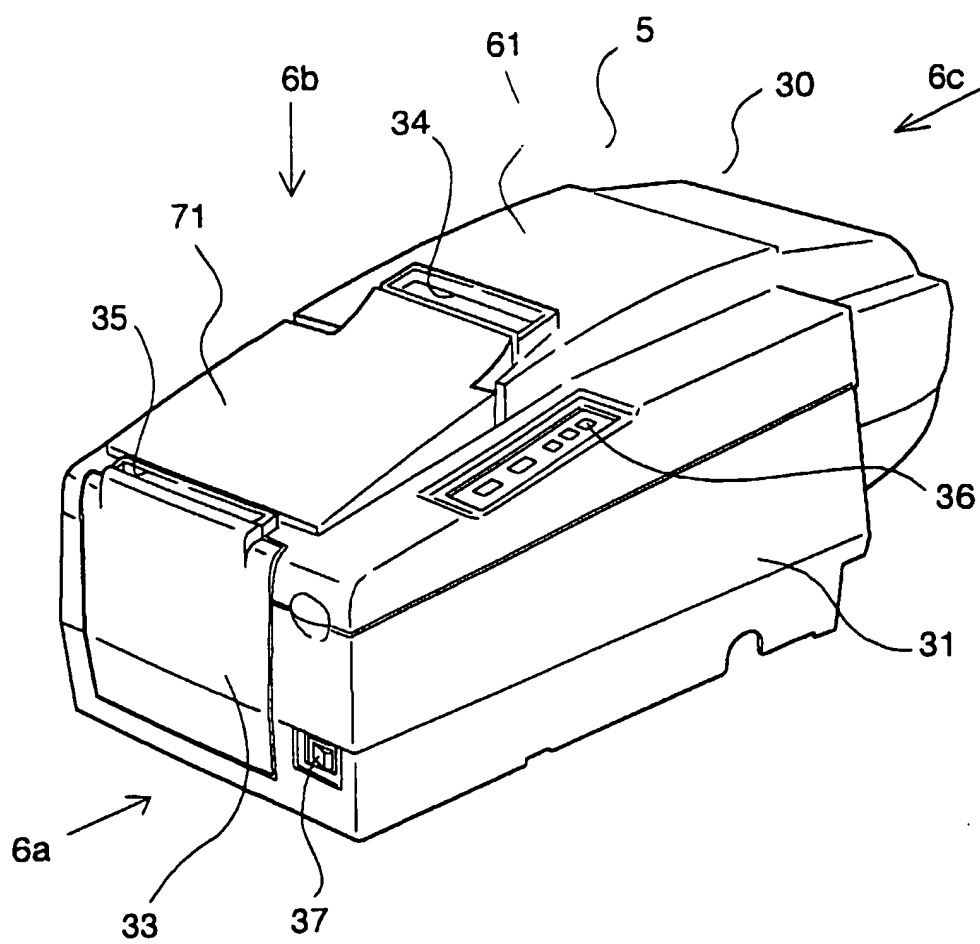


FIG. 1

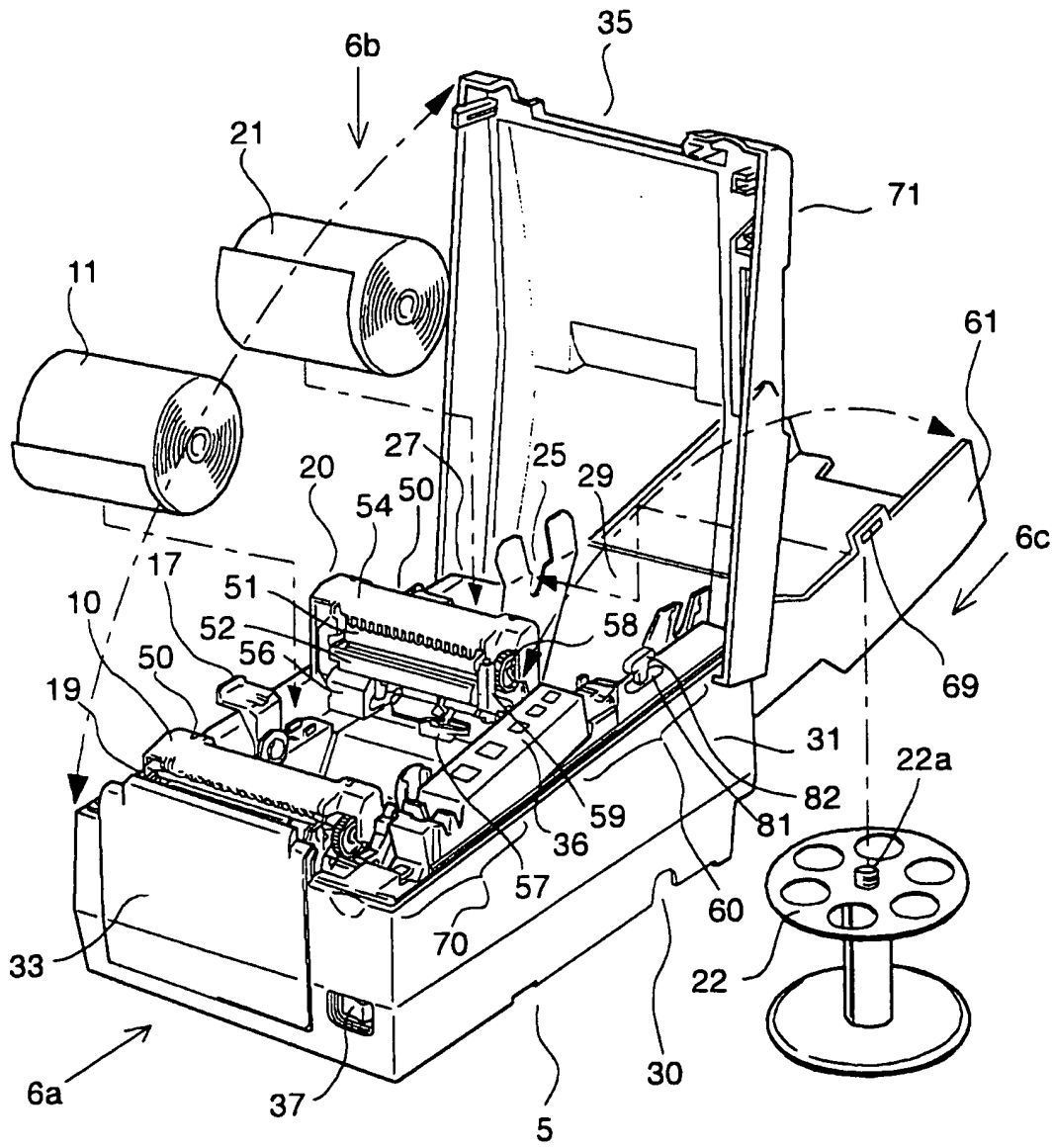


FIG. 2

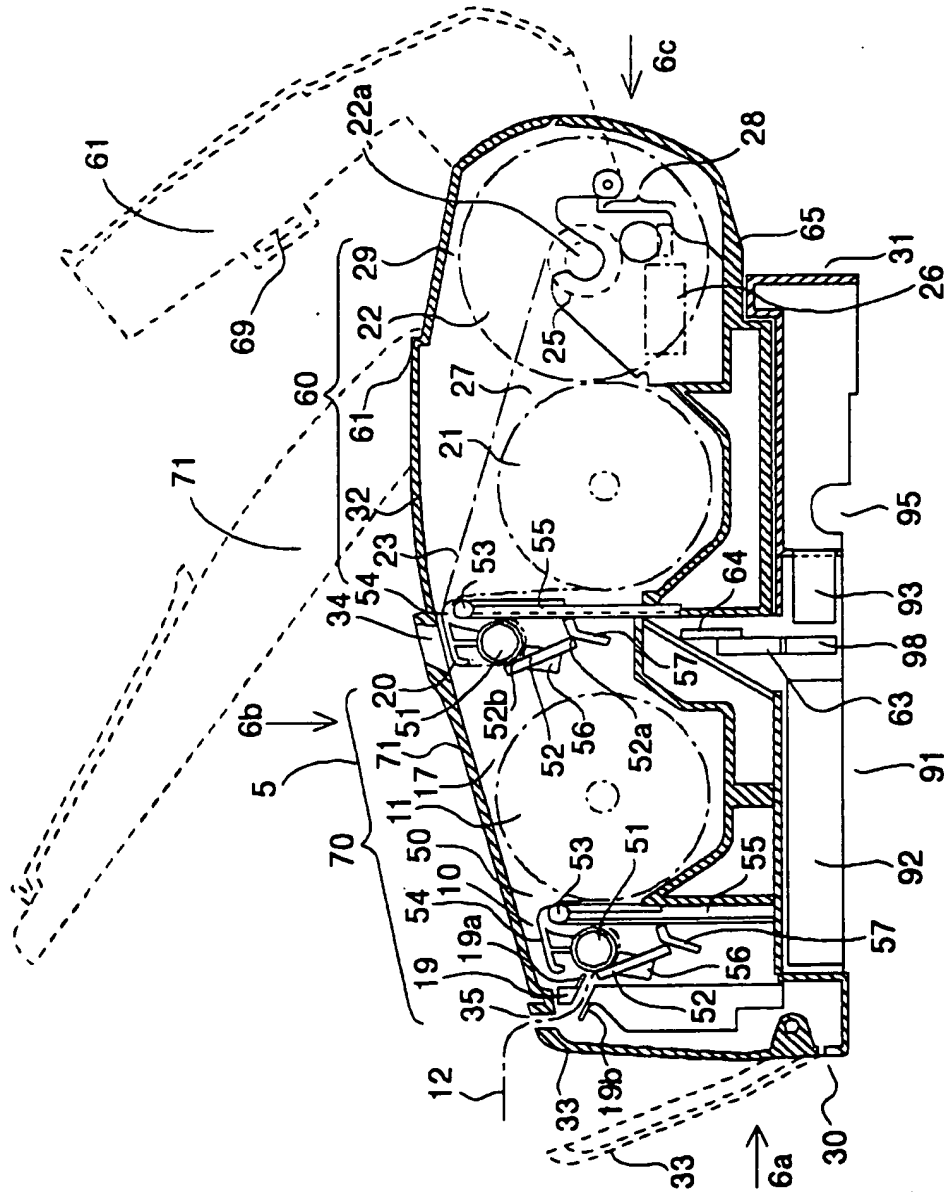


FIG. 3

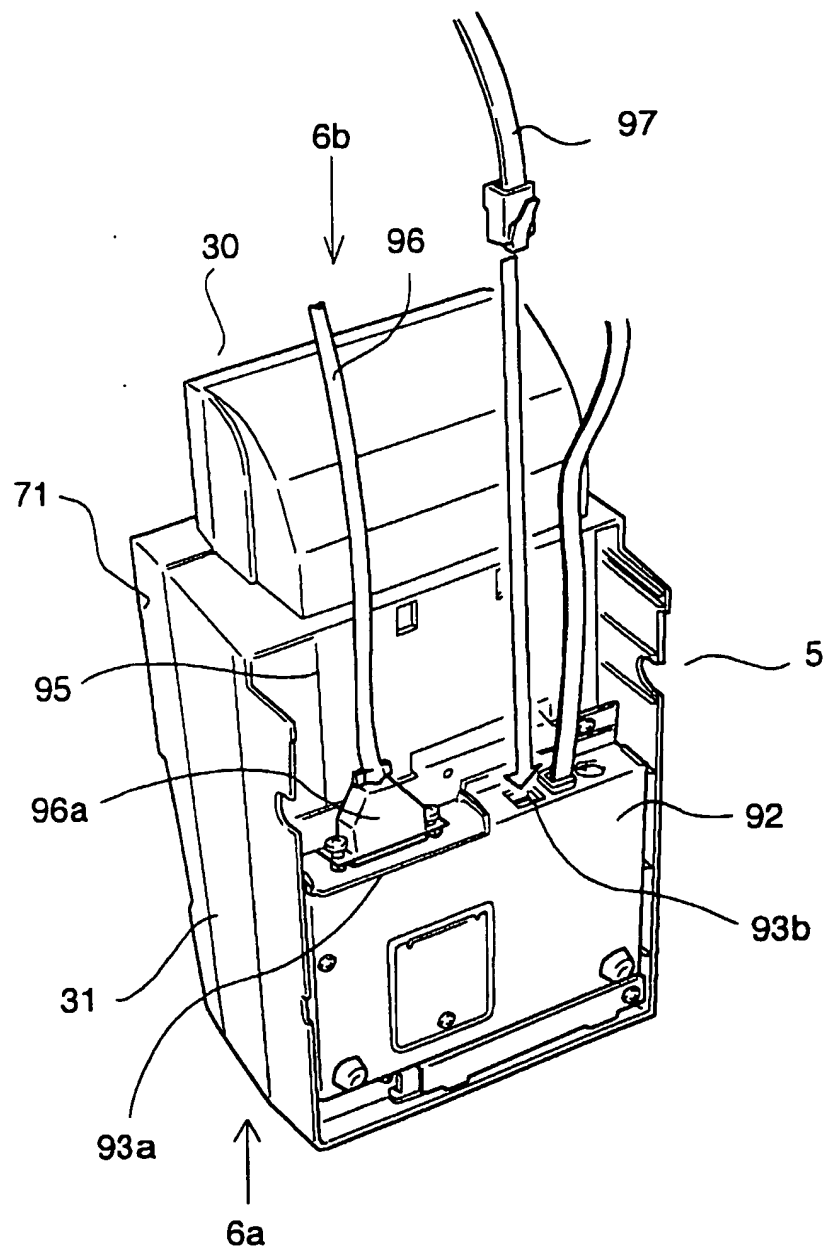


FIG. 4

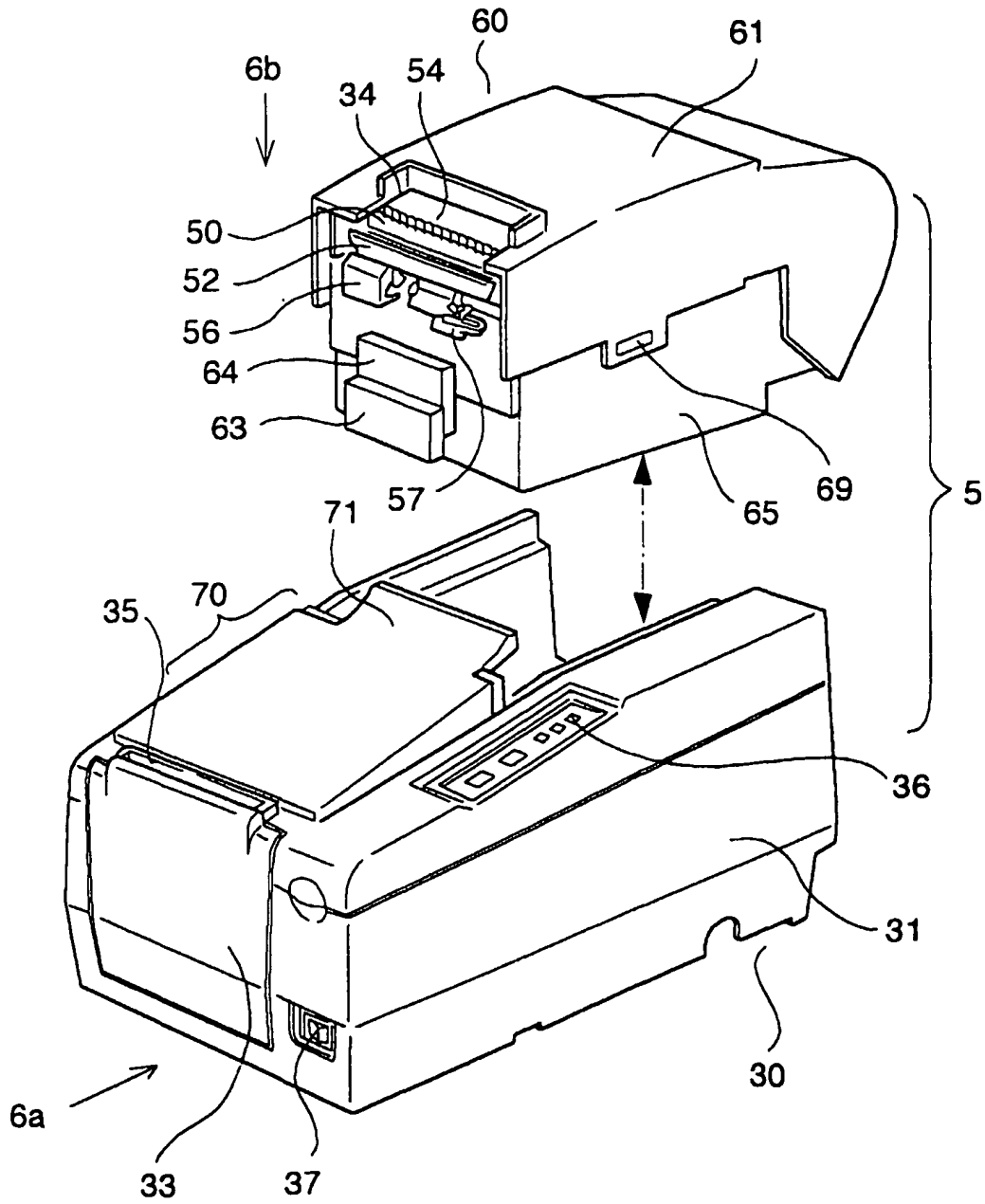


FIG. 5

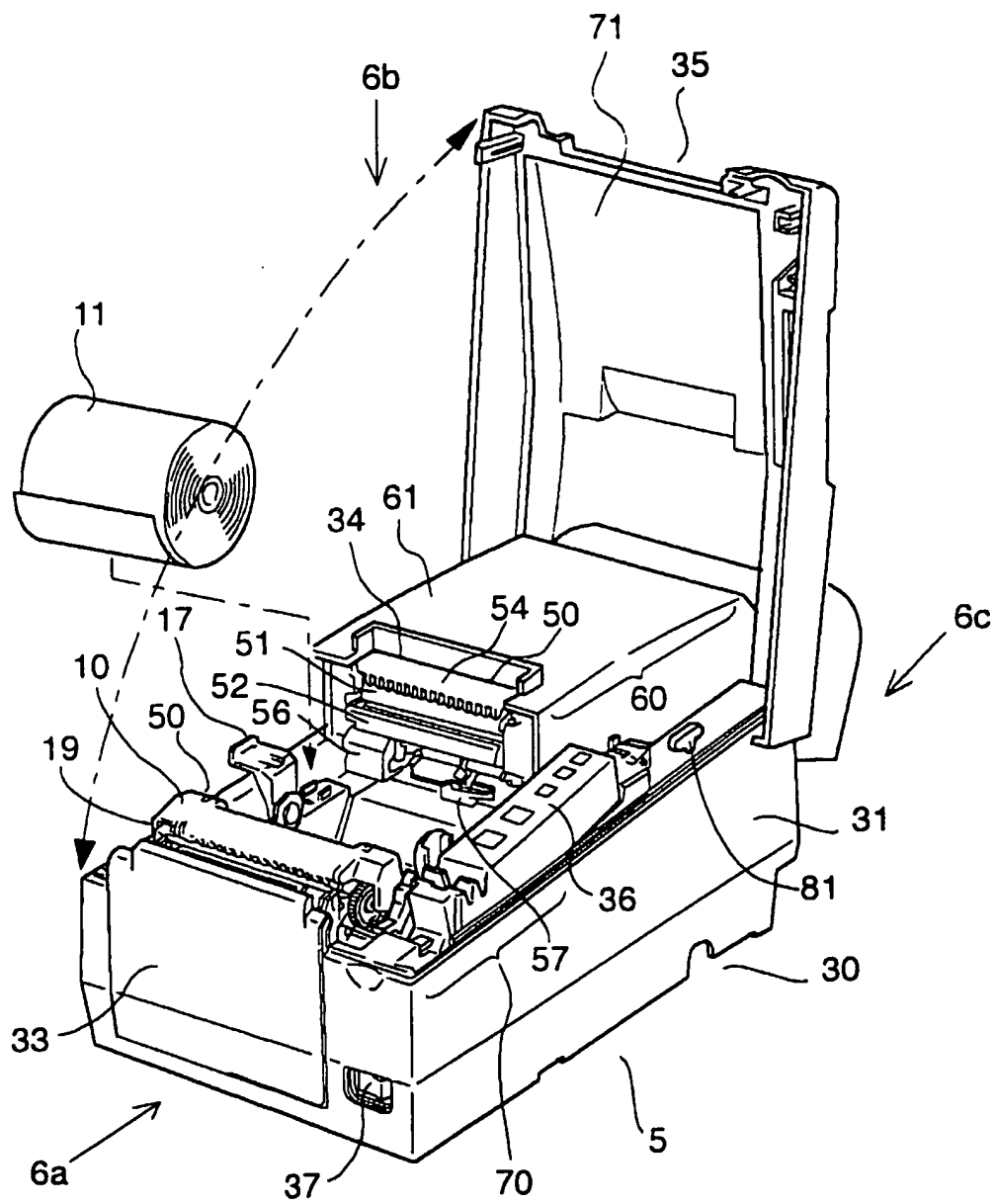


FIG. 6

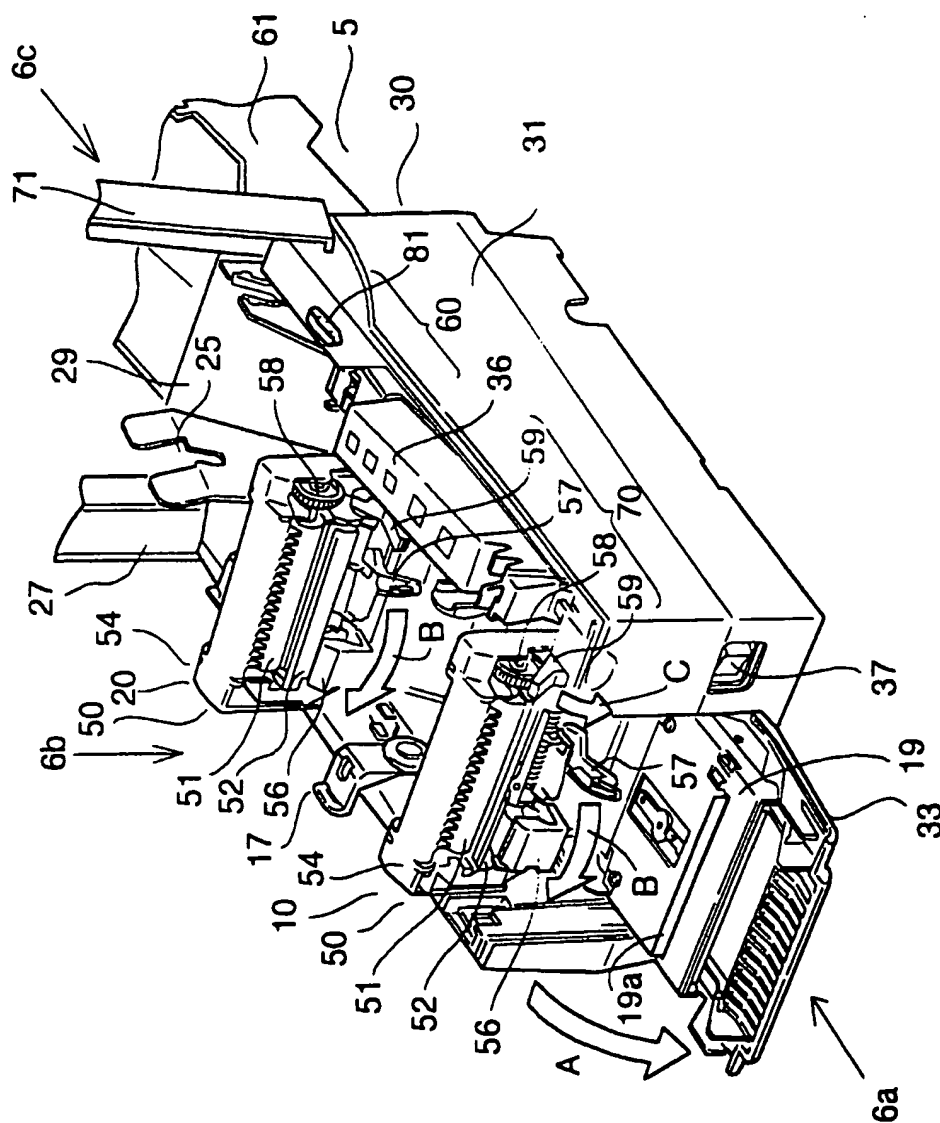


FIG. 7



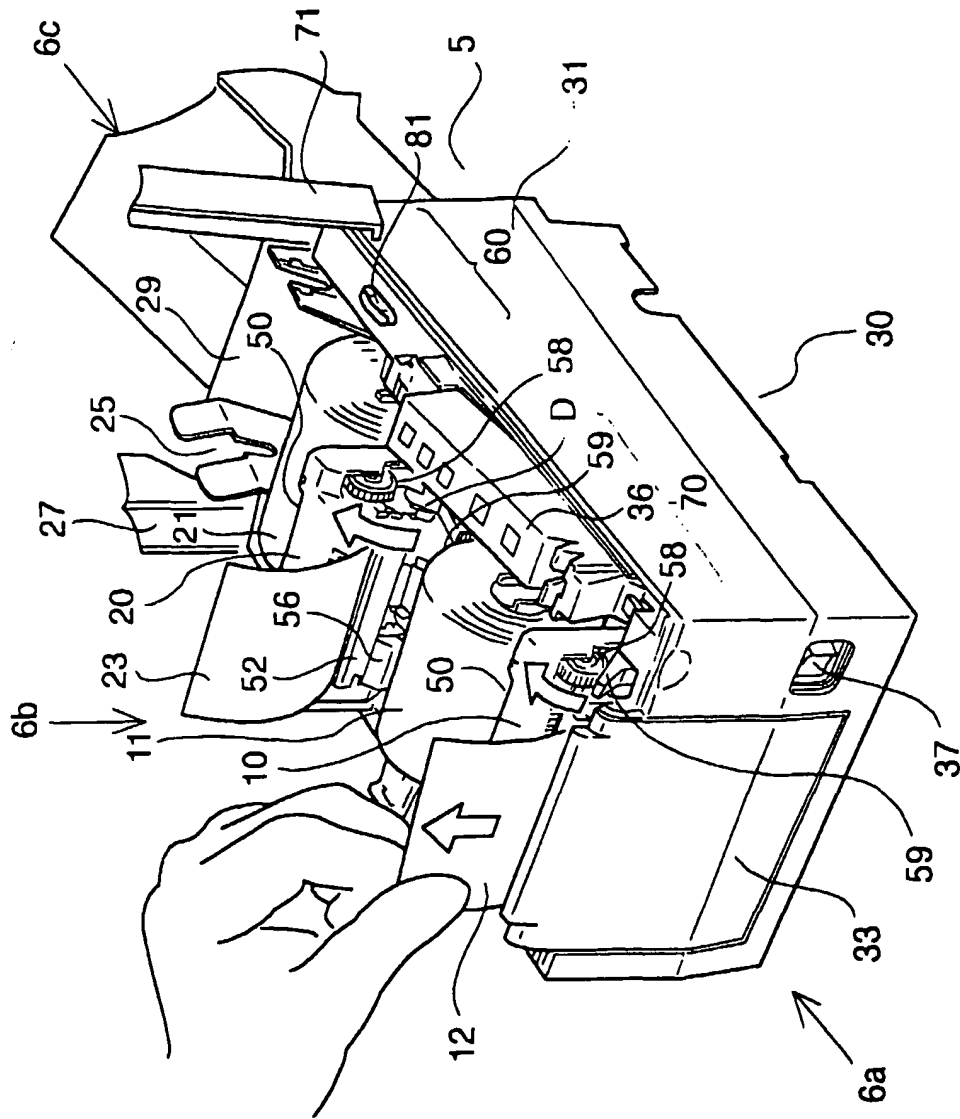


FIG. 8

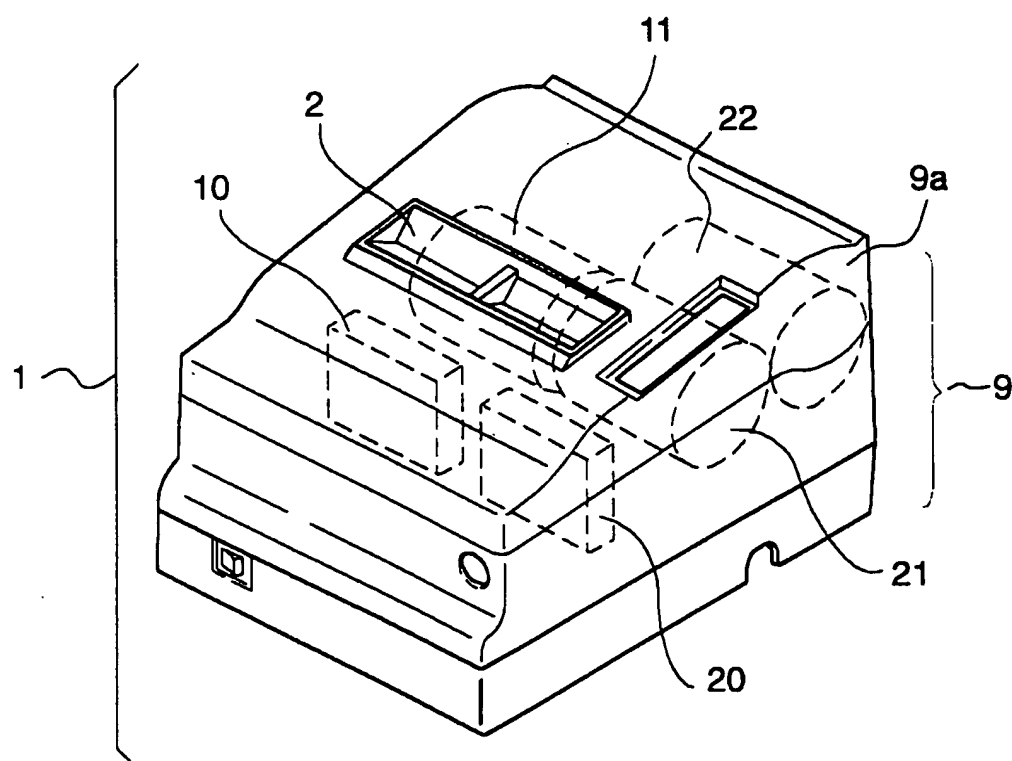


FIG. 9

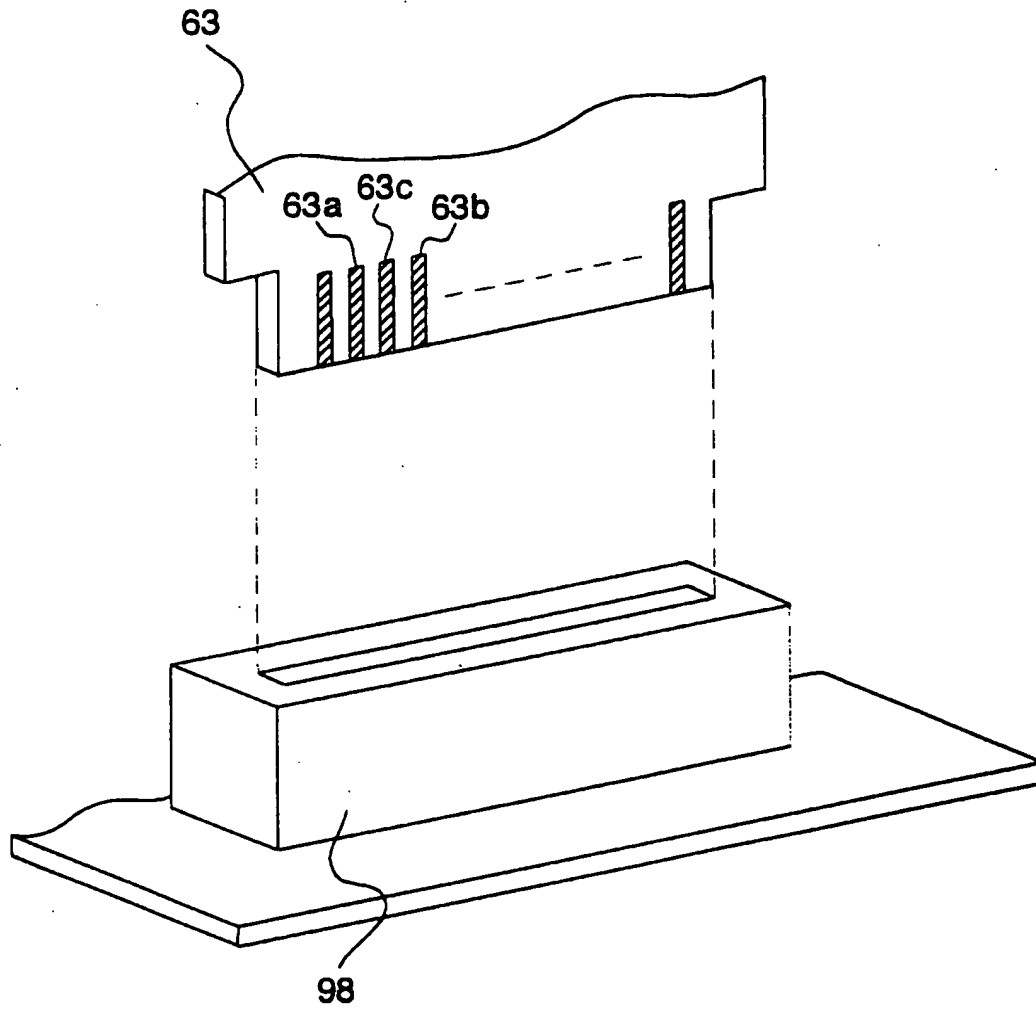


FIG. 10

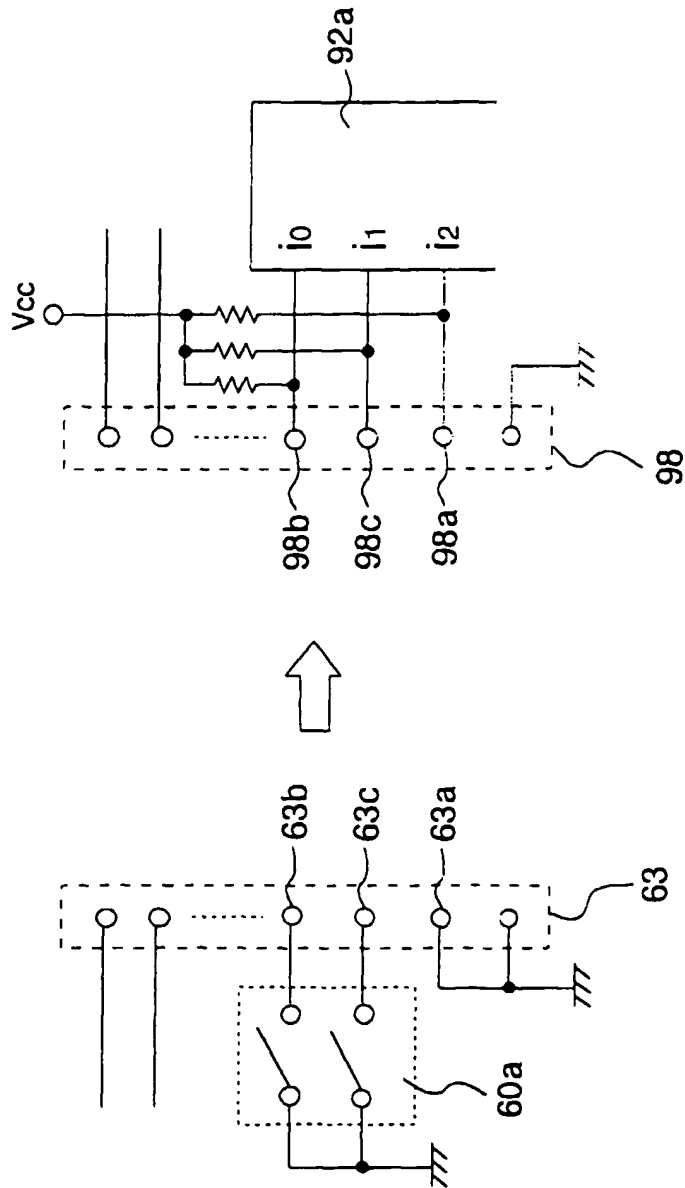


FIG. 11

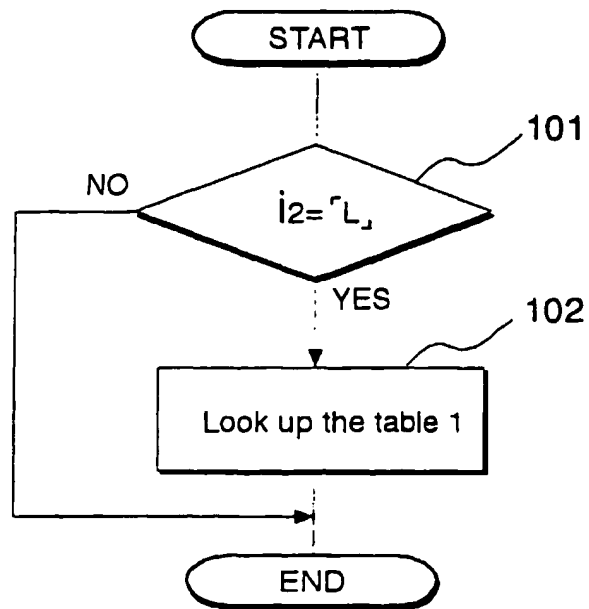


Table 1

| $i_0 \backslash i_1$ | H                     | L                   |
|----------------------|-----------------------|---------------------|
| H                    | journal<br>impact-dot | label<br>impact-dot |
| L                    | journal<br>thermal    | label<br>thermal    |

FIG. 12